AMENDMENTS TO THE CLAIMS:

The following listing of claims supersedes all prior versions and listings of claims

in this application:

1. (Currently Amended) ~~In a~~ A physical network of nodes, ~~wherein~~ the network

comprising ~~comprises~~:

~~at least one central node,~~

a plurality of ~~peripheral~~ nodes; ~~, and~~

a plurality of connections between said nodes; and

wherein each node is adapted to join the network by applying network connection

rules which:

(a) maintain a primary connection between the network element and

another network element in said network, said other network element being at a lowered

hierarchical level in a hierarchy of nodes in said network, wherein the hierarchy of

nodes in said network forms a ~~hierarchical~~ structure interconnecting ~~said~~ at least one

central node and ~~said~~ a plurality of peripheral nodes, the hierarchical structure being

configured to consider a newly joining ~~such that a~~ node ~~is considered~~ to be at a higher

level than a parent node to which it connects when joining the network;

(b) maintain a specified number N of further connections between a said

node and other nodes in the network; and

(c) cause the said node, upon receipt of a request from an additional node desiring to form its primary connection with the said node, and in the event that one of the N connections of the node is unallocated, to:

select one of the specified number of further connections which is not a primary connection with one of said other nodes; and

re-allocate that selected further connection from the other node to the additional node to form the primary connection for the said additional node,

wherein the above network connection rules impose constraints permitting for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections wherein each peripheral node in the network has at least the same number of connections as the said at least one central node;

wherein the above connection rules constrain the network topology as it grows to a desired size by cross-allocating links within each level of the network hierarchy until they are needed to provide an access point for new nodes; and

wherein each node in the network has the same number of first neighboring nodes , and network constraints are set such that for each of said at least one central node and each of said plurality of peripheral nodes a maximum number of connections are permitted, and each peripheral node in the network in the network is not allowed to have fewer connections than said at least one central node,

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a node comprising:

a parent node identifier arranged to identify a parent node at a lowest level in the network that is able to maintain secondary connections to other nodes in the network of the same lowest level;

a connection requester arranged to request one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and reallocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node;

a connection initiator and maintainer arranged to initiate and maintain a specified number k-1 of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection;

wherein the node is constrained by the same connection rules as other nodes in the network to have a maximum number of k connections, and

if the node is a peripheral node the node has at least the same number of connections as more central nodes in the network.

2. (Cancelled)

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3. (Currently Amended) A ~~node~~ network according to claim 1, wherein each node is further adapted to attempt to maintain the specified number of k-1 further connections between the node and other nodes in the network by periodically carrying out:

for each unallocated one of the k-1 connections, selecting a node from one or more candidate nodes, and forming a connection with the selected node, until either the k-1 further connections have been successfully completed or there are no more candidate nodes.

4. (Currently Amended) A ~~node~~ network according to claim 3, wherein selecting a peer node comprises selecting the peer node at random from the one or more candidate nodes.

5. (Currently Amended) A ~~node~~ network according to claim 3, wherein selecting the node comprises selecting the node on the basis of the range of the candidate nodes to the node.

6. (Currently Amended) A ~~node~~ network according to claim 5, wherein the network comprises an overlay network formed over an underlying network of nodes,

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and wherein the range between a candidate node and the node comprises the number of links between them in the underlying network.

7. (Cancelled)

8. (Currently Amended) A ~~node~~ network according to claim 6, wherein each node is further adapted to identify another node as a prospective parent node on the basis of the range of the other node to the node.

9. (Currently Amended) A ~~node~~ network according to claim 6, wherein each node is further adapted to identify another node as a prospective parent node if it is within a specified range of the node.

10. (Currently Amended) A ~~node~~ network according to claim 1, wherein each node is further adapted, in the event that the primary connection fails, to re-establish a primary connection with another node which is at a lower level in the network hierarchy than the node.

11. (Cancelled)

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12. (Currently Amended) A method of <u>operating</u> ~~joining a node to~~ a physical network <u>of nodes</u>, wherein the network comprises:

at least one central node, <u>and</u>

a plurality of peripheral nodes, ~~and~~

~~a hierarchical structure~~ <u>arranged in a nodal network hierarchy wherein the</u> <u>structure of the nodal hierarchy</u> interconnecting said at least one central node and said plurality of peripheral nodes~~, the hierarchical structure being~~ <u>is</u> configured to consider a node to be at a higher level than a parent node to which it connects when joining the network, ~~and~~ <u>the</u> network ~~constraints are set such that for each of said at least one~~ ~~central node and each of said plurality of peripheral nodes a maximum number of~~ ~~connections are permitted, and each peripheral node in the network in the network is~~ ~~not allowed to have fewer connections than said at least one central node, the physical~~ ~~network having a topology type in which each node joining the network is constrained~~ ~~by the same connection rules to have a maximum number of k connections, and~~ ~~wherein the peripheral nodes are not allowed to have fewer connections than the~~ ~~central nodes in the network, the method~~ comprising:

<u>applying connection rule constraints to nodes, the connection rules applied</u> <u>comprising:</u>

<u>(a) each node joining the network maintaining a primary connection to a node at</u> <u>a lower level in the nodal network hierarchy;</u>

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(b) maintaining a specified number N of further connections between said node and other nodes in the network; and

(c) upon receipt of a request at a receiving node from an additional node desiring to form its primary connection with the receiving node, and in the event that none of the N connections of the receiving node are unallocated, then:

(i) selecting one of the N further connections which is not a primary connection for one of the other nodes; and

(ii) re-allocating the selected further connection to the additional node so as to form the primary connection for the additional node,

wherein the above connection rules constrain the network topology as it grows to a desired size by cross-allocating links within each level of the network hierarchy until they are needed to provide an access point for new nodes; and

wherein each node in the network has the same number of first neighboring nodes

~~identifying a parent node at a lowest level in the network that is to maintain secondary connections to other nodes in the network of the same lowest level;~~

~~requesting one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and reallocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node;~~

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~~initiating and maintaining a specified number k-1 of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection, the node being constrained to have at least the same number of connections as central nodes in the network.~~

13. (Cancelled)

14. (Currently Amended) A method of operating a network according to claim 35 ~~12~~, in which attempting to maintain the specified number of k-1 further connections to the other nodes in the network comprises periodically carrying out:

for each unallocated one of the k-1 connections, selecting a node from one or more candidate nodes, and forming a connection with the selected node, until either the k-1 further connections have been successfully completed or there are no more candidate nodes.

15. (Currently Amended) A method of operating a network according to claim 35 ~~12~~, in which selecting a peer node comprises selecting the peer node at random from the one or more candidate nodes.

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16. (Currently Amended) A method <u>of operating a network</u> according to claim 14, wherein selecting the node comprises selecting the node on the basis of the range of the candidate nodes to the node.

17. (Currently Amended) A method <u>of operating a network</u> according to claim 16, wherein the network comprises an overlay network formed over an underlying network of nodes, and wherein the range between a candidate node and the node comprises the number of links between them in the underlying network.

18. (Cancelled)

19. (Currently Amended) A method <u>of operating a network</u> according to claim 17, ~~comprising identifying~~ <u>wherein</u> another node <u>is identified</u> as a prospective parent node on the basis of the range of the other node to the node.

20. (Previously Presented) A method <u>of operating a network</u> according to claim 17, ~~comprising identifying~~ <u>wherein</u> another node <u>is identified</u> as a prospective parent node if it is within a specified range of the node.

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21. (Currently Amended) A method of operating a network according to claim 35, wherein 12, further comprising, in the event that the additional node's requested primary connection to the identified parent fails, the additional node re-establishing re-establishes a primary connection with another node which is at a lower level in the network hierarchy than the additional node.

22. (Cancelled)

23. (Currently Amended) A tangible non-transitory data store containing a computer program comprising instructions for causing one or more processors to operate as the a node in the network according to claim 1 when the instructions are executed by the processor or processors.

24. (Currently Amended) A non-transitory storage medium carrying computer readable code representing instructions for causing one or more processors to operate as the a node in the network according to claim 1 when the instructions are executed by the processor or processors.

25. (Cancelled)

26. (Currently Amended) A tangible <u>non-transitory</u> data store containing a computer program comprising instructions for causing one or more processors to perform the method according to claim 12 when the instructions are executed by the processor or processors.

27. (Currently Amended) A <u>non-transitory</u> storage medium carrying computer readable code representing instructions for causing one or more processors to perform the method according to claim 12 when the instructions are executed by the processor or processors.

28-33. (Cancelled)

34. (New) A network according to claim 1, wherein each node in the network comprises:

a parent node identifier arranged to identify at a lowest level in the network that is able to maintain secondary connections to other nodes in the network of the same lowest level;

a connection requester arranged to request one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and

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re-allocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node;

a connection initiator and maintainer arranged to initiate and maintain a specified number k-1 of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection;

wherein the node is constrained by the same connection rules as other nodes in the network to have a maximum number of k connections, and

if the node is a peripheral node, the node has at least the same number of connections as more central nodes in the network.

35. (New) A method of operating a network according to claim 12, wherein the method further comprises:

joining an additional node to the network by applying said connection rule constraints to cause, for each of said at least one central node and each of said plurality of peripheral nodes, the maximum number of connections k permitted to be maintained, and each peripheral node in the network to have at least the same number of connections as said at least one central node, and wherein that the physical network topology after said additional node has joined the network is constrained by the same connection rules to have a maximum number of k connections, and wherein the

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peripheral nodes are not allowed to have fewer connections than the central nodes in the network,

the method further comprising said additional node:

identifying a parent node at a lowest level in the network that is to maintain secondary connections to other nodes in the network of the same lowest level;

requesting one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and re-allocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node; and

initiating and maintaining a specified number k-1 of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection, the node being constrained to have at least the same number of connections as central nodes in the network.

36. (New) A physical network of nodes, wherein the network comprises:

a plurality of nodes consisting of at least one central node, and

a plurality of peripheral nodes,

wherein said plurality of nodes are arranged in a hierarchical structure interconnecting said at least one central node and said plurality of peripheral nodes,

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wherein a node is considered to be at a higher level in said hierarchical structure than a parent node to which it connects when joining the network, and

wherein said physical network of nodes network constraints imposed by connection rules on the network topology constrain each of said at least one central node and each of said plurality of peripheral nodes to have a maximum number of connections, and each peripheral node in the network to have no fewer connections than said at least one central node,

a peripheral node comprising:

a parent node identifier arranged to identify a parent node at a lowest level in the network that is able to maintain secondary connections to other nodes in the network of the same lowest level;

a connection requester arranged to request one of the secondary connections of the parent node to other nodes in the network of the same level be terminated and re-allocated to the node if the identified parent node has no free links to become a primary connection between the identified parent node and the node; and

a connection initiator and maintainer arranged to initiate and maintain a specified number k-1 of further connections between the node and other nodes in the network having the same level in the hierarchy as the node and which are advertising a spare connection;

wherein the peripheral node is constrained by the same connection rules as

other nodes in the network to have a maximum number of k connections, and has at

least the same number of connections as more central nodes in the network,

wherein the above connection rules constrain the network topology as it grows to

a desired size by cross-allocating links within each level of the network hierarchy until

they are needed to provide an access point for new nodes; and

wherein each node in the network has the same number of first neighboring

nodes.

37. (New) A physical network of nodes comprising:

a plurality of nodes consisting of at least one central node, and

a plurality of peripheral nodes,

wherein said plurality of nodes are arranged in a hierarchical structure

interconnecting said at least one central node and said plurality of peripheral nodes,

wherein a node is considered to be at a higher level in said hierarchical structure than a

parent node to which it connects when joining the network,

wherein said physical network of nodes network constraints imposed by

connection rules on the network topology constrain each of said at least one central

node and each of said plurality of peripheral nodes to have a maximum number of

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connections, and each peripheral node in the network to have no fewer connections

than said at least one central node,

wherein each of said plurality of peripheral nodes comprises:

a parent node identifier arranged to identify a parent node at a lowest level in the

network that is able to maintain secondary connections to other nodes in the network of

the same lowest level;

a connection requester arranged to request one of the secondary connections of

the parent node to other nodes in the network of the same level be terminated and

re-allocated to the node if the identified parent node has no free links to become a

primary connection between the identified parent node and the node; and

a connection initiator and maintainer arranged to initiate and maintain a specified

number k-1 of further connections between the node and other nodes in the network

having the same level in the hierarchy as the node and which are advertising a spare

connection,

wherein each peripheral node is constrained by the same connection rules as

other nodes in the network to have a maximum number of k connections, and has at

least the same number of connections as more central nodes in the network, and

wherein the above connection rules constrain the network topology as it grows to

a desired size by cross-allocating links within each level of the network hierarchy until

they are needed to provide an access point for new nodes; and

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wherein each node in the network has the same number of first neighboring nodes.

38. (New) A network of nodes comprising:

a plurality of nodes consisting of a central node and a plurality of peripheral nodes, each node being arranged in a hierarchical structure in which one of said plurality of nodes is considered to be at a higher level than a parent node to which it connects when joining the network,

wherein each said peripheral node is adapted to:

(a) maintain a primary connection to a node at a lower level in the network hierarchy;

(b) to attempt to maintain a specified number N of further connections between itself and other peripheral nodes on the same level of the network hierarchy in the network; and

(c) upon receipt of a request from an additional node desiring to form its primary connection with the said peripheral node, and in the event that none of the N connections of the peripheral node is unallocated, then to:

select one of the further connections which is not a primary connection for one of the other peripheral nodes; and

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re-allocate that selected further connection to the additional node so as to

form the primary connection for the additional node,

wherein the network connection rules constrain the topology of the network of

nodes as it grows to a desired size by cross-allocating links within each level of the

network hierarchy until they are needed to provide an access point for new peripheral

nodes; and

wherein each peripheral node in the network has the same number of first

neighboring peripheral nodes.

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